

## INTERNATIONAL COOPERATION TREATY

PCT

## NOTIFICATION OF ELECTION

(PCT Rule 61.2)

From the INTERNATIONAL BUREAU

To

Commissioner  
 US Department of Commerce  
 United States Patent and Trademark  
 Office, PCT  
 2011 South Clark Place Room  
 CP2/5C24  
 Arlington, VA 22202  
 ETATS-UNIS D'AMERIQUE  
 in its capacity as elected Office

<b>Date of mailing</b> (day month year) 13 June 2001 (13.06.01)	
<b>International application No.</b> PCT/CN99/00141	<b>Applicant's or agent's file reference</b> PCTIM9911HK
<b>International filing date</b> (day/month/year) 07 September 1999 (07.09.99)	<b>Priority date</b> (day/month/year)
<b>Applicant</b> ZHANG, Wei	

1. The designated Office is hereby notified of its election made:

☒ in the demand filed with the International Preliminary Examining Authority on:  
 22 February 2001 (22.02.01)

☐ in a notice effecting later election filed with the International Bureau on:

2. The election ☒ was  
☐ was not

made before the expiration of 19 months from the priority date or, where Rule 32 applies, within the time limit under Rule 32.2(b)

<b>The International Bureau of WIPO</b> 34, chemin des Colombettes 1211 Geneva 20, Switzerland Facsimile No : (41-22) 740 14 35	<b>Authorized officer</b> Zakaria EL KHODARY Telephone No : (41-22) 338 83 38
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Postfach 10 15 000  
2000 EV GUSSEN, 2000  
T +31 (0) 340 2040  
F +31 (0) 340 2040  
FAX +31 (0) 340 2040

Europäisches  
Patentamt

Zweigstelle  
in Den Haag  
Geschäftsbereich  
Erfindungen

European  
Patent Office

Branch at  
The Hague  
Search  
Division

Office européen  
des brevets

Département A  
La Haye  
Division de la  
recherche

Power, Philippa Louise  
Frank B. Dehn & Co.,  
179 Queen Victoria Street  
London EC4V 4EL  
GRANDE BRETAGNE

FILE 77749

11 NOV 2002

SEARCHED

Datum Date

08.11.02

Zeichen Fig. Fig.

15.77749

Anmeldung Nr. Application No. Demande n° Patent Nr. Patent No. Brevet n°

99942704.0-2307-CN9900141

Anmelder Applicant Demandeur Patenthaber Proprietor Titulaire

Primrose Holdings Limited

## COMMUNICATION

The European Patent Office herewith transmits as an enclosure the European search report for the above-mentioned European patent application.

If applicable, copies of the documents cited in the European search report are attached

☒ Additional set(s) of copies of the documents cited in the European search report is (are) enclosed as well.

RECEIVED  
MAR 03 2003  
GROUP 1700

## REFUND OF THE SEARCH FEE

If applicable under Article 10 Rules relating to fees, a separate communication from the Receiving Section on the refund of the search fee will be sent later.





European Patent  
Office

SUPPLEMENTARY  
EUROPEAN SEARCH REPORT

Application Number  
EP 99 94 2704

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl. 7)
X	DATABASE WPI Section Ch, Week 199049 Derwent Publications Ltd., London, GB; Class A32, AN 1990-367404 XP002216199 - & SU 1 541 063 A (LOW VOLTAGE EQUIP), 7 February 1990 (1990-02-07) * abstract *	1-9	D02J3/GC B29C33/38 A47G19/C3 D01D5/00 B29C43/C8 B29C43/52
X	DE 840 597 C (LEO ZEILENTIN BERLIN LICHTENRA) 3 June 1952 (1952-06-03) * page 1, column 1 - page 3, column 9, figures 1-5 *	1-9	
X	US 3 337 920 A (HUNTER EDWARD I ET AL) 29 August 1967 (1967-08-29) * column 1, line 15 - column 3, line 25; figures 1-3 *	1-9	
X	EP 0 474 125 A (TOYO SEIKAN KAISHA LTD) 11 March 1992 (1992-03-11) * column 16, line 46 - column 30, line 23; figures 1,8-21 *	1-9	TECHNICAL FIELDS SEARCHED (Int.Cl. 7) B29C
The supplementary search report has been based on the last set of claims valid and available at the start of the search.			

3

EP FORM 1501 (01/82) (P04C04)

Place of search

MUNICH

Date of completion of the search

10 October 2002

Examiner

Lanz, P

CATEGORY OF CITED DOCUMENTS

- X particularly relevant if taken alone
- Y particularly relevant if combined with another document of the same category
- A technological background
- O non-written disclosure
- P intermediate document

- T theory or principle underlying the invention
- E earlier patent document, but published on, or after the filing date
- D document cited in the application
- L document cited for other reasons
- & member of the same patent family, corresponding document

**ANNEX TO THE EUROPEAN SEARCH REPORT  
ON EUROPEAN PATENT APPLICATION NO.**

EP 99 94 2704

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.  
The members are as contained in the European Patent Office EPO file on:  
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

10-10-2002

Patent document cited in search report		Publication date	Patent family members		Publication date
SU 1541063	A	07-02-1990	SU	1541063 A1	07-02-1990
DE 840597	C	03-06-1952	NONE		
US 3337920	A	29-08-1967	GB	1099363 A	17-01-1968
			DE	1454928 A1	20-02-1969
			FR	1411358 A	17-09-1965
EP 0474125	A	11-03-1992	JP	3076995 B2	14-08-2000
			JP	4239609 A	27-08-1992
			JP	2808354 B2	08-10-1998
			JP	4118125 A	20-04-1992
			AU	637520 B2	27-05-1993
			AU	8263891 A	12-03-1992
			DE	69117232 D1	28-03-1996
			DE	69117232 T2	10-10-1996
			EP	0474125 A2	11-03-1992
			US	5200201 A	06-04-1993
			KR	190201 B1	01-06-1999

# INTERNATIONAL SEARCH REPORT

International application No.

PCT/CN99/00141

## A. CLASSIFICATION OF SUBJECT MATTER

IPC D02J3/00, B29C33/38, A47G19/03, D01D5/00.

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

D02J3/00-3/18, B29C33/00, 33/38, 33/44, A47G19/00, 19/03, D01D5/005/08.

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

CHINESE INVENTION 1985-2000. CHINESE UTILITY MODELS 1985-2000

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

WPIS, EPODOC, CNPAT, PAJ

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
E,X	CN2349245Y (ZHANG WEI, CAO CHENG DE) 17.Nov.1999 see entire document	1-9
E,X	CN2339608Y (XIA JING ZAN) 22.Sep.1999 see entire document	1-9
E,X	CN1242453A (ZHANG WEI, CAO CHENG DE) 26.Jan.2000 see entire document	1-9

☐ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

\* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim (S) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search  
26.May.2000(26.05.00)

Date of mailing of the international search report

15 JUN 2000 (15.06.00)

Name and mailing address of the ISA/CN

6 Xitucheng Rd., Jimen Bridge, Haidian District,  
100088 Beijing, China

Facsimile No. 86-10-62019451

Authorized officer

MAO HONG

Telephone No. 86-10-62093741

Form PCT/ISA /2:0 (second sheet) (July 1998)

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization  
International Bureau



1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99 100

(43) International Publication Date  
15 March 2001 (15.03.2001)

PCT

(10) International Publication Number  
WO 01/18292 A1

(51) International Patent Classification:  
B29C 33/38, A47G 19/03, D01D 5/00

D02J 3/00, (81)

Designated States (national): AE, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DE, DK, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, UA, UG, US, UZ, VN, YU, ZA, ZW.

(21) International Application Number: PCT/CN99/00141

(22) International Filing Date:  
7 September 1999 (07.09.1999)

(25) Filing Language: English

(26) Publication Language: English

(71) Applicant (for all designated States except CN, US):  
PRIMROSE HOLDINGS LIMITED [—/—]; Huntlaw  
(KY).

(84) Designated States (regional): ARIPO patent (GH, GM, KE, LS, MW, SD, SL, SZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).

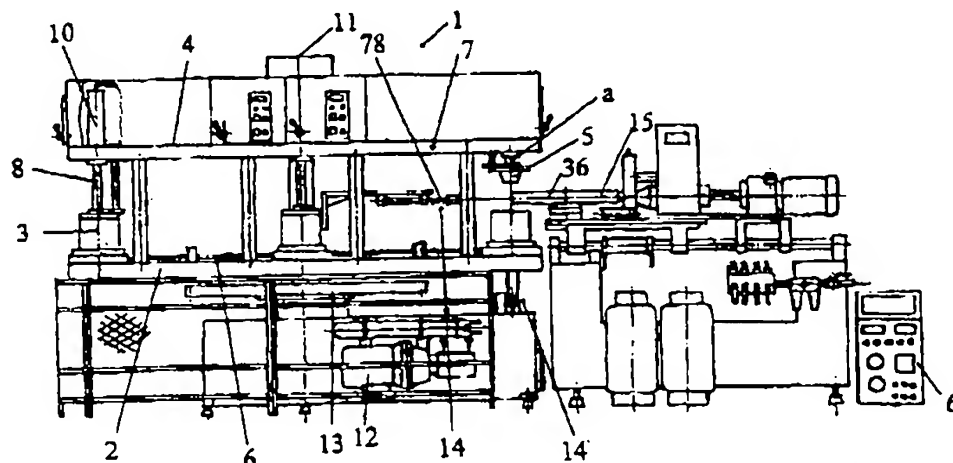
With international search report.

(71) Applicant and  
(72) Inventor (for CN, US only): ZHANG, Wei [CN/CN];  
NO. 89(-10-4) Tong Hun Road, Wuchang District Wuhan,  
Hubei (CN).

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(74) Agent: CHINA SINDA INTELLECTUAL PROPERTY  
LIMITED; China Garment Mansion, Suite 1300, NO. 99  
Jianguo Road, Chaoyang District, Beijing 100020 (CN).

(54) Title: APPARATUS FOR MANUFACTURING BIODEGRADABLE PLANT FIBRE PRODUCTS



(57) Abstract: This invention provides a molding apparatus for the molding of foamed fibre products. A plurality of upper and lower molds are provided on simultaneously rotating supports such that each co-operating pair of molds is open during a specific portion of the cycle of rotation. While open, a previous product is ejected, the molds may be cleaned and releasing agent introduced and further material introduced to the mold for a subsequent molding operation. The mold then closes and continues rotation.

WO 01/18292 A1

REC'D 07 MAR 2002

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## INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

International reference number 09/041718	<b>FOR FURTHER ACTION</b> See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA 416)	
	International filing date (day month year) 07 Sep 1999 (07/09/99)	Priority date (day month year)
International Classification and IPC A47C1/03; D06D5/00		
APPOSE HOLDINGS LIMITED et al		
<p>A preliminary examination report has been prepared by this International Preliminary Examining Authority and transmitted to the applicant according to Article 36.</p> <p>The report consists of a total of 3 sheets, including this cover sheet.</p> <p>The report is composed by ANNEXES, i.e., sheets of the description, claims and/or drawings which have been transmitted to the Authority for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and the Administrative Instructions under the PCT).</p> <p>The report consists of a total of 3 sheets.</p>		
<p>Observations relating to the following items</p> <p>Substantive examination</p> <p>Statement of opinion with regard to novelty, inventive step and industrial applicability</p> <p>Statement of invention</p> <p>Statement under Article 35(2) with regard to novelty, inventive step or industrial applicability, and supporting explanations supporting such statement</p> <p>References cited</p> <p>Comments on the international application</p> <p>Comments on the international application</p>		
Date of completion of this report 06 Feb 2002	Date of completion of this report 06 Feb 2002	
Name of the IPEA CN Beijing District Beijing, China	Authorized officer Telephone No 86-10-62093741	

# INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No.  
PC/ CN 99 00141

## Basis of the report

1. This report is based on the elements of the international application \*

1.1 the international application as originally filed

1.2 the description

\_\_\_\_\_ as originally filed

\_\_\_\_\_ filed with the demand

\_\_\_\_\_ filed with the letter of \_\_\_\_\_

\_\_\_\_\_ as originally filed

\_\_\_\_\_ as amended (together with any statement) under Article 19

\_\_\_\_\_ filed with the demand

\_\_\_\_\_ filed with the letter of \_\_\_\_\_

1.3 the claims

\_\_\_\_\_ as originally filed

\_\_\_\_\_ filed with the demand

\_\_\_\_\_ filed with the letter of \_\_\_\_\_

1.4 the drawings

\_\_\_\_\_ as originally filed

\_\_\_\_\_ filed with the demand

\_\_\_\_\_ filed with the letter of \_\_\_\_\_

2. In addition to the language all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item

3. Elements were available or furnished to this Authority in the following language \_\_\_\_\_ which is:

\_\_\_\_\_ a translation furnished for the purposes of international search (under Rule 23.1(b))

\_\_\_\_\_ a translation of the international application (under Rule 48.3(b))

\_\_\_\_\_ a translation furnished for the purposes of international preliminary examination (under Rules 55.2

4. **Sequence listing:** In the international application, the international sequence listing was carried out on the basis of the sequence listing

\_\_\_\_\_ in the international application in written form

\_\_\_\_\_ in the international application in computer readable form

\_\_\_\_\_ submitted to this Authority in written form

\_\_\_\_\_ submitted to this Authority in computer readable form

5. It is noted that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished

6. It is noted that the information recorded in computer readable form is identical to the written sequence listing has been

7. It is noted that the following have resulted in the cancellation of

the description, pages \_\_\_\_\_

the claims, Nos. \_\_\_\_\_

the drawings, sheets fig. \_\_\_\_\_

8. It is noted that it has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)) \*\*

9. *Amendments have been furnished to the receiving Office in response to an invitation under Article 14 are referred to as "invited amendments" and are not annexed to this report since they do not contain amendments (Rules 70.16 and*

*70.17). Such amendments must be referred to under item 9 and annexed to this report*



# INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No.  
PCT/CN99/00141

## Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability: citations and explanations supporting such statement

### Novelty

Chinese (CN)

Claims 1-9 YES

Claims NO

Chinese (JPUS)

Claims 1-9 YES

Claims NO

Industrial applicability (IA)

Claims 1-9 YES

Claims NO

### Technical explanations (Rule 70.7)

The technical solutions of claims 1-9 meet the needs of the criteria in PCT Article 33(2)-(3), because the prior art not teach or fairly suggest the claims molding apparatus comprising first and second mold supports, a rotational mounting and drive means, at least one product ejecting means and material feeder, control means, et al.

According to the technical content disclosed in the description, there is no reason to doubt the industrial applicability of the present application, so the claims 1-9 meet the criteria in PCT Article 33(4).

### CITATIONS

# PCT

## DEMAND

### CHAPTER II

Under Article 31 of the Patent Cooperation Treaty:  
The undersigned requests that the international application specified below be the subject of international preliminary examination according to the Patent Cooperation Treaty and hereby elects all eligible States (except where otherwise indicated).

For International Preliminary Examining Authority use only

Identification of IPEA	Date of receipt of DEMAND
------------------------	---------------------------

Box No I IDENTIFICATION OF THE INTERNATIONAL APPLICATION		Applicant's or agent's file reference PCTIM9911HK	
International application No. PCT/CN99/00141	International filing date (day/month/year) 07 September, 1999	(Earliest) Priority date (day/month/year)	
Title of invention <b>APPARATUS FOR MANUFACTURING BIODEGRADABLE PLANT FIBRE PRODUCTS</b>			
Box No. II APPLICANT(S)			
Name and address: (Family name followed by given name: for a legal entity, full official designation. The address must include postal code and name of country.) Primrose Holdings Limited Huntlaw Building, P.O. Box 2804, George Town, Grand Cayman		Telephone No.:	
		Facsimile No.:	
		Teleprinter No.:	
State (that is, country) of nationality: CN		State (that is, country) of residence: CN	
Name and address: (Family name followed by given name: for a legal entity, full official designation. The address must include postal code and name of country.)			
State (that is, country) of nationality:		State (that is, country) of residence:	
Name and address: (Family name followed by given name: for a legal entity, full official designation. The address must include postal code and name of country.)			
State (that is, country) of nationality:		State (that is, country) of residence:	
<input type="checkbox"/> Further applicants are indicated on a continuation sheet.			

## Box No.III AGENT OR COMMON REPRESENTATIVE: OR ADDRESS FOR CORRESPONDENCE

The following person is ☒ agent ☐ common representative  
and ☒ has been appointed earlier and represents the applicant(s) also for international preliminary examination.  
☐ is hereby appointed and any earlier appointment of (an) agent(s)/common representative is hereby revoked.  
☐ is hereby appointed, specifically for the procedure before the International Preliminary Examining Authority, in addition to the agent(s)/common representative appointed earlier.

Name and address: (Family name followed by given name, for a legal entity, full official designation.  
The address must include postal code and name of country.)

**CHINA SINDA INTELLECTUAL PROPERTY LTD.**  
Suite 1300, China Garment Mansion  
No.99 Jianguo Road, Chaoyang District  
Beijing, 100020, P.R.China

Telephone No.: (86)-10-65813466

Facsimile No.: (86)-10-65812937

Teleprinter No.: ■

☐ Address for correspondence: Mark this check-box where no agent or common representative is/has been appointed and the space above is used instead to indicate a special address to which correspondence should be sent.

## Box No.IV BASIS FOR INTERNATIONAL PRELIMINARY EXAMINATION

Statement concerning amendments: \*

1. The applicant wishes the international preliminary examination to start on the basis of:

☒ the international application as originally filedthe description ☒ as originally filed☐ as amended under Article 34the claims ☒ as originally filed☐ as amended under Article 19 (together with any accompanying statement)☐ as amended under Article 34the drawings ☒ as originally filed☐ as amended under Article 342. ☐ The applicant wishes any amendment to the claims under Article 19 to be considered as reversed.3. ☐ The applicant wishes the start of the international preliminary examination to be postponed until the expiration of 20 months from the priority date unless the International Preliminary Examining Authority receives a copy of any amendments made under Article 19 or a notice from the applicant that he does not wish to make such amendments (Rule 69.1(d)). (This check-box may be marked only where the time limit under Article 19 has not yet expired. )

\* Where no check-box is marked, international preliminary examination will start on the basis of the international application as originally filed or, Where a copy of amendments to the claims under Article 19 and/or amendments of the international application under Article 34 are received by the International Preliminary Examining Authority before it has begun to draw up a written opinion or the international preliminary examination report, as so amended.

Language for the purposes of international preliminary examination:

☒ which is the language in which the international application was filed.☐ which is the language of a translation furnished for the purposes of international search.☐ which is the language of publication of the international application.☐ which is the language of the translation (to be) furnished for the purposes of international preliminary examination.

## Box No.V ELECTION OF STATES

The applicant hereby elects all eligible States (that is, all States which have been designated and which are bound by Chapter II of the PCT) excluding the following States which the applicant wishes not to elect:

## Box No. VI CHECK LIST

The demand is accompanied by the following elements, in the language referred to in Box No. IV, for the purposes of international preliminary examination:

- |   |         |
|---|---------|
| 1. translation of international application                             | sheets  |
| 2. amendments under Article 34  | sheets  |
| 3. copy(or, where required, translation) of amendments under Article 19 | sheets  |
| 4. copy(or, where required, translation) of statement under Article 19  | sheets  |
| 5. letter   | 1 sheet |
| 6. other(specify)   | sheets  |

For International Preliminary  
Examining Authority use only

Received	not received
<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>

- THE FOLLOWING ARE REQUIRED:
- ☒ fee calculation sheet
  - ☐ separate signed power of attorney
  - ☐ copy of general power of attorney; reference number, if any:

- ☐ statement explaining nature of invention
- ☐ nucleotide and/or amino acid sequence listing in computer readable form
- ☐ other (specify):

## Box No. VII SIGNATURE OF APPLICANT, AGENT OR COMMON REPRESENTATIVE

Next to each signature, indicate the name of the person signing and the capacity in which the person signs (if such capacity is not obvious from reading the demand).



For International Preliminary Examining Authority use only

1. Date of actual receipt of DEMAND:

2. Adjusted date of receipt of demand due to CORRECTIONS under Rule 60.1(b):

- ☐ The date of receipt of the demand is AFTER the expiration of 19 months from the priority date and item 4 or 5, below, does not apply. ☐ The applicant has been informed accordingly.
- ☐ The date of receipt of the demand is WITHIN the period of 19 months from the priority date as extended by virtue of Rule 80.5.
- ☐ Although the date of receipt of the demand is after the expiration of 19 months from the priority date, the delay in arrival is EXCUSED pursuant to Rule 82.

For International Bureau use only

Demand received from IPEA on:

See Notes to the demand form

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization  
International Bureau



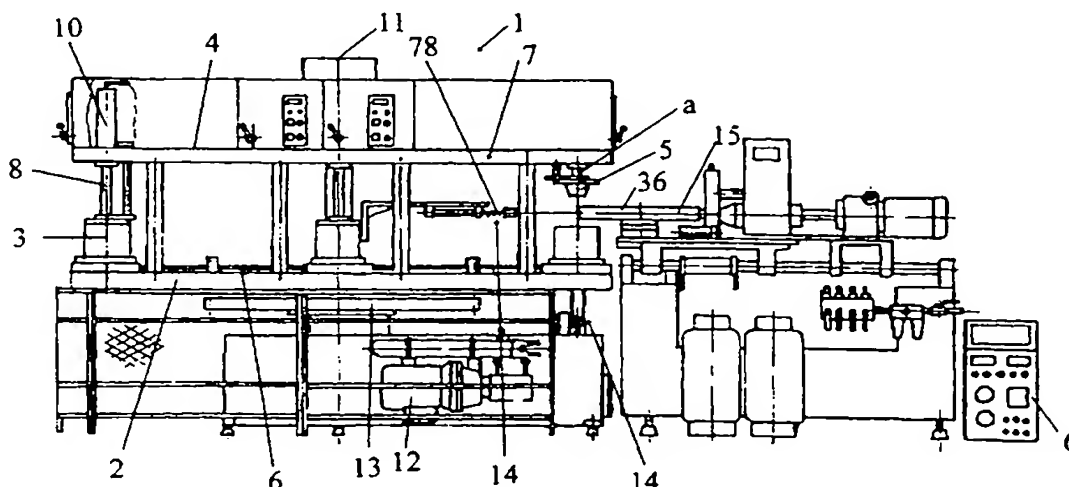
(43) International Publication Date  
15 March 2001 (15.03.2001)

PCT

(10) International Publication Number  
**WO 01/18292 A1**

- (51) International Patent Classification: D02J 3/00, B29C 33/38, A47G 19/03, D01D 5/00
- (21) International Application Number: PCT/CN99/00141
- (22) International Filing Date:  
7 September 1999 (07.09.1999)
- (25) Filing Language: English
- (26) Publication Language: English
- (71) Applicant (for all designated States except CN, US):  
**PRIMROSE HOLDINGS LIMITED** [—]; Huntlaw Building, P.O. Box 2804, George Town, Grand Cayman (KY).
- (72) Inventor (for CN, US only): **ZHANG, Wei** [CN/CN]; NO. 89(-10-4) Tong Hun Road, Wucheng District Wuhan, Hubei (CN).
- (74) Agent: **CHINA SINDA INTELLECTUAL PROPERTY LIMITED**; China Garment Mansion, Suite 1300, NO. 99 Jianguo Road, Chaoyang District, Beijing 100020 (CN).
- (81) Designated States (national): AE, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DE, DK, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, UA, UG, US, UZ, VN, YU, ZA, ZW.
- (84) Designated States (regional): ARIPO patent (GH, GM, KE, LS, MW, SD, SL, SZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).
- Published:  
--- With international search report
- For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(54) Title: APPARATUS FOR MANUFACTURING BIODEGRADABLE PLANT FIBRE PRODUCTS



(57) Abstract: This invention provides a molding apparatus for the molding of foamed fibre products. A plurality of upper and lower molds are provided on simultaneously rotating supports such that each co-operating pair of molds is open during a specific portion of the cycle of rotation. While open, a previous product is ejected, the molds may be cleaned and releasing agent introduced and further material introduced to the mold for a subsequent molding operation. The mold then closes and continues rotation.

WO 01/18292 A1

# APPARATUS FOR MANUFACTURING BIODEGRADABLE PLANT FIBRE PRODUCTS

## FIELD OF THE INVENTION

This invention relates to a molding apparatus and, in particular, although not  
5 necessarily solely, an apparatus for the molding of biodegradable fibre foam materials

## BACKGROUND TO THE INVENTION

For sometime, the fast food industry has been using a variety of packages or  
materials for containing the food served in an outlet. However, these packages are not  
10 all biodegradable and can cause problems to the environment.

Improved materials for the manufacture of such packaging have been  
developed including foam materials made from biodegradable fibres. However,  
although the material has been developed, apparatus for the automatic production of  
15 packages using this type of material has not been readily developed.

Conventional forms of plastic moldings such as rotational or injection molding  
are unsuitable for this type of material. The material requires curing at elevated  
temperatures and pressures for a pre-determined period of time and is not suitable for  
20 passage through the injectors of an injection molding machine.

As a result, such materials have been formed into packages using relatively  
simplistic means. These involve simple manually operated dies or molds utilizing a  
lever to press opposed mold portions together. To produce packaging for the fast food  
25 industry or other industries where such biodegradable packaging may be desirable

requires an apparatus capable of automatic control and production to increase efficiency.

Additionally, the manual nature of the previous apparatus has led to a variety  
5 in the quality of product produced with an operator being unable to ensure an even temperature, pressure and time operation.

### OBJECT OF THE INVENTION

It is an object of the present invention to provide an automatic apparatus for  
10 the production of fibre foam items that will overcome some of the problems and disadvantages of the prior art to provide more efficient production and/or higher quality product or at least provide the public with a useful choice.

### SUMMARY OF THE INVENTION

15 The present invention may broadly be said to consist in a molding apparatus comprising:

- a first mold support means having a plurality of individual mold portions on one side thereof;
- a second mold support means having a plurality of mold portions on  
20 one side thereof, said sides of said first and second mold support means on which said mold portions are mounted opposing each other and said mold portions being arranged on said mold support means to form a plurality of cooperating pairs of mold portions to form a plurality of mold cavities therebetween;

- a rotational mounting and drive means to allow simultaneous rotation of said first and second mold support means about a common axis;
- means to open and close said pairs of mold portions independently at discrete intervals throughout the rotation of the mold support means;
- 5 - at least one product ejecting means positioned adjacent said mold support means to eject finished product from said mold cavities when a pair of said molding portions are open;
- at least one material feeder adjacent said mold support means to introduce material to said mold portions after a previous product has been ejected and also while said pair of mold portions are open; and
- 10 - control means to control at least the temperature of said mold portions.

#### BRIEF DESCRIPTION OF THE DRAWINGS

Preferred embodiments of the invention will now be described with reference  
15 to the following drawings in which:

- Fig. 1 shows an elevational view of one embodiment of a molding apparatus in accordance with this invention;
- Fig. 2 is a schematic view of the surface of one of the mold support means to show the arrangement of the molding portions;
- 20 - Fig. 3 is a further plan view of the mold support means showing the arrangement of the associated apparatus;
- Fig. 4 is a diagrammatic chart detailing the timing sequence of the operations;
- Fig. 5 is a cross-sectional elevation through a material feeding unit
- 25 forming part of the apparatus of Fig. 1.



- Fig. 6 is a plan view of the apparatus of Fig. 5;
- Fig. 7 is a cross-sectional elevation through a pair of molding portions of the preferred embodiment; and
- Fig. 8 is a further cross-sectional elevation of the apparatus of Fig. 7 in an open condition.

### DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

This invention relates to a molding machine to mold products generally from a fibre material. Such products may be used as utensils such as dishes for the fast food industry or various kinds of packaging.

Aspects of this apparatus may well be applied to molding machines for other materials although the preferred embodiment described is generally in relation to the production of products from such a fibre foam material.

Referring to Fig. 1, the apparatus comprises a machine 1 having a first mold support means 2 on which may be positioned a plurality of molding portions 3. The molding portions 3 are positioned on a first side 6 of the mold support means 2.

Opposing this first mold support means 2 is a second mold support means 4. The second mold support means 4 is separated from the first mold support means 2 and carries a plurality of molding portions 5. Again, these molding portions 5 are arranged on a face 7 of the second mold support means 4 and are arranged such that they oppose and cooperate with the molding portions 3 on the first mold support means 2.

With such an arrangement, the molding portions 3 and 5 on the opposed mold support means 2 and 4 cooperate to form pairs of molding portions creating an individual mold cavity between each pair.

5 Means for opening and closing the cooperating pairs of molding portions 3 and 5 are provided for each pair of molding portions. As shown in this preferred embodiment, the upper molding portion 5 is driven by an arm 8 which itself may be powered by a hydraulic cylinder or similar 10. This hydraulic cylinder 10 can both regulate the pressure of the molding operation and also close the mold when required.

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The upper mold portion 5 is capable of assuming an open condition as shown in position 9 on Fig. 1 in which arm 8 connected to this upper portion 5 has retracted into the second mold support means 4. The retraction of this can be performed hydraulically, mechanically or by such other means as may be desired.

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It should be noted that in general, this preferred embodiment arranges the first and second mold support means 2 and 4 as a lower and upper mold support means respectively. The reference to upper and lower throughout the description is provided in relation to this particular embodiment although it is the relative arrangement rather  
20 than the spacial configuration which is important. In general, it has been found that the provision of an upper and lower mold support means and operation of the molds intermediate of the support means may provide an easier configuration of the associated apparatus arranged around the mold support means.

The first and second mold support means 2 and 4 are both concentrically mounted about a generally central axis 11. Drive means 12 are provided in the form of a motor or similar which acts through a transmission including a main gear 13 or similar to drive the simultaneous rotation of both the first and second mold support means. The simultaneous rotation is required to avoid any relative movement in the horizontal direction between the lower and upper mold portions 3 and 5 with each pair of mold portions 3 and 5 moving together on the installation positions about the axis 11.

The form of drive to create the rotation and the manner in which a transmission is provided to drive the mold support means 2 and 4 can comprise any variety of mechanisms to achieve this purpose.

By rotating the mold support means 2 and 4, other apparatus can be arranged adjacent the rotational path of the pairs of molding portions 3 and 5.

This other apparatus arranged adjacent the rotational path of the molding portions may include means 14 to eject the product and a material feeding or loading apparatus 15 to refill the mold cavity with material for a subsequent molding operation.

This preferred embodiment utilizes the rotation of the mold support means 2 and 4 to time the molding operation. Each pair of molding portions 3 and 5 is in an open condition at a specific interval during the rotation to allow the previous product to be ejected and further material to be introduced to the mold. Throughout the

remainder of the rotation, the mold is closed under controlled temperature and pressure conditions to create the molded product itself.

This preferred embodiment utilizes a single product ejecting means 14 and material feeding apparatus 15 around the rotational path of the molding portions 3 and 5. Of course, alternative embodiments could provide two or more sets of these additional portions of apparatus at discreet intervals around the mold support means 2 and 4, the molding operation being completed in, for example, a 180 degree rotation of the mold support means 2 and 4 rather than the full molding operation taking place over a 360 degree rotation of the mold support means 2 and 4 as shown in this embodiment.

The arrangement of the mold portions 3 and 5 in this preferred embodiment is such that they are substantially concentrically arranged around the central axis 11. This minimizes any need for adjustment or movement of the associated apparatus such as the product ejecting means 14 and material feeder 15. However, in other embodiments, the cooperating pairs of molding portions 3 and 5 may be in a staggered formation on the mold support means 2 and 4 or align in inner and outer concentric circles on the opposed faces 6 and 7 of the mold support means 2 and 4.

20

Referring to Fig. 2, a plan view of the first mold support means 2 of the preferred embodiment is shown. It can be seen that the mold portions 3 are arranged in a single concentric circle towards the outer edge 16 of the support means 2. To provide simpler positioning of the apparatus around the support means 2, the support means 2 is preferably provided with a generally circular outer circumference and each

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of the mold portions are positioned equal distant from that outer edge and, also preferably, at an equal radial angle "X" from each other. The distinction of mold portion 5 on support means 4 is similar.

5 Referring to Fig. 3, the support means 2 is shown with the material feeding apparatus 15 adjacent the rotatable support means 2. A controller 26 is provided to have overall control over the operations of the unit.

With the material feeding unit and other apparatus positioned adjacent the  
10 rotatable support means 2 and 4, rotation of those support means may be either continuous or intermittent.

If continuous, the associated apparatus needs to operate with the molding portions moving pass the apparatus. For example, in the case of the material feeder  
15 15, this must be able to deliver the material while the mold continues to pass the apparatus and needs to be timed to deliver the material while sufficient of the mold is adjacent to the apparatus 15 to accept the material. Alternatively, some motion of the material feeding unit 15 with the turntable over at least a distance sufficient to deliver the material is necessary.

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An alternative operation is provided if the mold support means 2 and 4 are moved intermittently to bring each mold adjacent the associated apparatus such as the material feeding unit 15 and then remain stationary while the operation is carried out. The drive can then be re-engaged by the control means to rotate the table to position  
25 another mold adjacent the apparatus 15 and other such apparatus. All this control

over the drive may be provided by a controller 26 activating, deactivating or regulating the speed of the drive as required.

The material feeding apparatus 15 is shown in more detail in Figs. 5 and 6.

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Referring to these figures, the material feeding apparatus 15 can be seen to comprise an initial funnel or hopper 38 to receive the material in bulk. A screw conveyor 37 is driven by a motor 39 to deliver the material to a rotating table 36. This rotating table 36 acts to convey the material from the screw conveyor 37 to the molds themselves. As shown in Fig. 1, the table 36 rotates to pass over the cavity of molds 3.

The rotating table 36 contains cylinders 42 which receive a portion of the material 41 from the screw conveyor 37. The material 41 is forced into the cylinder 42 and the quantity is controlled by a piston 32 moving within the cylinder 42. An adjustable stop 34 is provided which contacts a rearward element of the piston 32 to limit the travel of the piston 32. In this preferred form, the stop 34 is provided in the form of a screw thread having an angled face 43 which meets and co-operates with similarly angled face 44 at the rear of the piston 32. As the faces meet at an angle intermediate of the direction of the screw thread 34 and the piston travel, the stop position of the piston 32 can be adjusted by the rotation and resultant penetration of the stop means 34 into the cylinder 42.

A further stop means 33 is provided to limit the outward travel of the piston 32.

As shown in the plan view in Fig. 6, a plurality of the cylinders 42 may be provided around the circumference of the table 36 which rotates about a central axis 35. In operation, the material 41 is fed into the end of the cylinders 42 and the quantity is controlled by the rearward travel of the piston 32.

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As the table rotates, the cylinders 42 will pass over molds rotating beneath an opposed side of the table 36 as shown in Fig. 1. At that time, a fluid may be introduced to the cylinders 42 through an inlet 40 rearward of the piston 32. This fluid may be a compressible gas or hydraulic fluid as desired. In this preferred form,  
10 compressed air is introduced to the cylinder 42.

The introduction of the fluid forces the piston 32 to its outward position and delivers the material 41 into the mold passing beneath.

15 As shown in Fig. 6, the table 36 rotates in the direction of the arrow 45 being an opposed direction to the rotation of the mold support means 2 and 4. Such rotation ensures that the cylinders 42 are provided with additional time passing over the molds beneath as the molds and the cylinders 42 travel over intersecting arcuate paths.

20 The intersection of the arcuate paths of the molds and the cylinders 42 are such that the mold support means 2 and 4 can continue their rotation during the delivery of the material rather than utilizing an intermittent rotation of the mold support means. The timing of the delivery of the material can be controlled through the timing of the introduction of the compressed gas through the inlet 40 and can be

microprocessor controlled or position sensor controlled or mechanically timed as desired.

Referring to Figs. 7 and 8, the molding portions 3 and 5 can be seen in greater detail.

Referring firstly to Fig. 7, it can be seen that the apparatus includes temperature control mechanisms in each of the molds such that the molds may operate at different temperatures. In this Fig. 7, the upper and lower mold portions 5 and 3 respectively are shown in a closed condition to form a mold cavity 50 between them.

Heating means 58 and 59 are provided to the upper and lower molds 5 and 3 respectively. It should be noted that the purpose is to elevate the temperature of the molding operation and this preferred form provides this with heaters in both the upper and lower molds. However, in alternative embodiments, it may be possible to utilize a single heater.

This preferred embodiment uses electrically powered heating coils for the heating means 58 and 59 which are disbursed evenly around the molding surfaces.

The heating of the mold may be controlled by the placement of suitable sensors 56 placed in the molds adjacent the mold surface. Alternatively, the sensors may be placed elsewhere on the mold to obtain a general indication of the molding temperature. The sensors 56 may be provided singularly or in plural and merely need to be thermally connected to the mold cavity.



The apparatus in Fig. 7 shows the upper and lower molds 5 and 3 in a closed condition. In this instance, the rod 8 attached to the upper mold is at a depressed state to close the mold. The upper mold has a mold seat 51 and above this there is provided a cooling system which, in this instance, comprises a fluid jacket 60. The lower mold 3 similarly has a fluid jacket 63 to allow the passage of coolant around the molds but away from the molding surface itself. This cooling system is provided in the preferred example so that the remainder of the apparatus is thermally insulated from the elevated temperatures created in the mold cavity 50. This avoids the need for other mechanical, electrical or similar components to be thermally protected.

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Each of the coolant jackets 60 and 63 have inlets 61 and 64 respectively for the entry of coolant and outlets 62 and 65 respectively for the outlet of the coolant. The flow of coolant around the jackets 60 and 63 allows excess heat from the molds to be drawn away for dispersion before the coolant is returned for another pass through the jackets 60 and 63.

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The coolant system can be provided by alternative means such as layers of thermal insulation although this does not allow the dispersion of the excess heat should it be created. The cooling fluid can be any suitable thermally conductive liquid or gas.

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This preferred embodiment provides information from suitable temperature sensors 56 to the overall control mechanism 26 which itself controls the operation of the heaters 58 and 59. The operation can comprise the switching on and off of the

heaters as required or a modulated control of the output of the heaters if this is preferred.

Turning to Fig. 8, the upper and lower molds 5 and 3 respectively are shown diagrammatically to demonstrate part of the product ejection mechanism 14.

In this figure, the upper mold 5 shown withdrawn from the lower mold 3. As the upper mold 5 is withdrawn, a push ring 71 biased by spring 74 operates to assist in the release of the product 76 from the surface of the upper mold 5. The push ring 71 is shown in cross section in Fig. 7 and can be seen to act on an upper edge of the product 76.

As the upper mold support 51 raises, the biasing means 74 in the form of a compression spring and its associated connecting bolt 73 drive the push ring 71 down over the surface of the upper mold 5. Only a short movement of the push ring 71 is needed to break the seal the product 76 has made against the upper mold 5.

The product 76 may be raised from the lower mold 3 through the use of a push rod 72 operating through the bottom of the mold 3.

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It will be appreciated that once the upper mold 5 has fully retracted, the push rod 72 can raise the product 76 clear of the lower mold 3 and the product 76 can be ejected transverse to the direction of travel of the push rod 72 by the ejection rod 78 shown in Fig. 1.

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Aside from the ejection mechanism 14 and the material feeding unit 15, other apparatus may be provided to operate while the mold is in an open condition. Specifically, the apparatus may include a cleaning step to remove debris from the molds prior to the entry of further material to form another product. In this preferred  
5 embodiment, the apparatus includes a nozzle for the outlet of compressed gas to blow debris from the mold. Other means could be utilized if desired.

Another intermediate step taken between the ejection of the product and the placement of new material may be the introduction of a lubricant or releasing agent  
10 into the mold. This can assist in the release of the product from the mold surfaces and again may be provided by a nozzle providing a spray of lubricant or releasing agent onto one or both of the upper and lower mold surfaces.

The controller 26 can control rotation of the upper and lower mold support  
15 means 2 and 4, the timing of the material feeding unit 15, the temperature of the molds and other operations as required. The sequence of events and the timing of events for this preferred embodiment is shown in Fig. 4.

Fig. 4 demonstrates a relative timing of operations. This details the operations  
20 generally over the period in which the mold is open with the line 81 showing the mold opening over the first two time units and closing over the last two time units and remaining in its fully open condition for the intermediate six time units.

The upper push ring operates slightly after the mold commences to open and once fully open, need only the bias into the open condition for a short time. This is shown by line 82 in Fig. 4.

- 5           The operation of the lower push rod is demonstrated by line 83 and operates slightly after the upper push ring commences its push up movement to allow the product to be pushed away from the cavity of mold 3 by push rod 72.

- 10           Line 84 shows the period of operation of the product push arm 78 to eject the product from the top of the lower push rod. This is timed to commence after the lower push rod has reached its extended position and finishes prior to the lower push rod lowering for a subsequent operation.

- 15           Line 85 shows the operation of the cleaning and spraying of lubricant or releasing agents into the molds. It is only following this step that material is reintroduced to the mold over the time period as shown by line 86. Once the material has been introduced to the mold, the mold can commence closing.

- 20           In operation, this preferred embodiment introduces material to the molds at which time the molds close and rotate in excess of 270 degrees around the central axis 11. The time taken for this rotation and the speed of rotation is determined by the time required for the molding operation.

As the mold approaches the completion of a cycle, the mold opens for the ejection of the product, the cleaning of the molds and introduction of the releasing agent before further material is introduced.

- 5           It can be seen that each pair of upper and lower molds 5 and 3 may undergo this cycle independently to provide a substantially continuous production of products from the apparatus.

- 10           Although this invention has been described with reference to a particular preferred embodiment, it will be appreciated that many of the steps or items of apparatus may be substituted for known equivalents or omitted if not essential to the operation. The invention should not be considered limited by the description which is provided by way of example but instead is defined by the appended claims.

CLAIMS

1. A molding apparatus comprising:
- a first mold support means having a plurality of individual mold portions on one side thereof;
  - a second mold support means having a plurality of mold portions on one side thereof, said sides of said first and second mold support means on which said mold portions are mounted opposing each other and said mold portions being arranged on said mold support means to form a plurality of cooperating pairs of mold portions to form a plurality of mold cavities therebetween;
  - a rotational mounting and drive means to allow simultaneous rotation of said first and second mold support means about a common axis;
  - means to open and close said pairs of mold portions independently at discreet intervals throughout the rotation of the mold support means;
  - at least one product ejecting means positioned adjacent said mold support means to eject finished product from said mold cavities when a pair of said molding portions are open;
  - at least one material feeder adjacent said mold support means to introduce material to said mold portions after a previous product has been ejected and also while said pair of mold portions are open; and
  - control means to control at least the temperature of said mold portions

2. A molding apparatus as claimed in claim 1 wherein said first and second mold support means are provided as lower and upper mold support means rotating in a substantially horizontal plane.
3. A molding apparatus as claimed in claim 1 wherein at least one of each pair of mold portions is provided with heating means to heat the product being molded.
4. A molding apparatus as claimed in claim 3 wherein both of said mold portions are provided with heating means.
5. A molding apparatus as claimed in claim 3 or claim 4 wherein said heating means comprise electrical heating coils within said mold portions.
- 15 6. A molding apparatus as claimed in claim 1 wherein a cooling means is provided to thermally insulate said mold portions from a remainder of said apparatus.
- 20 7. A molding apparatus as claimed in claim 1 wherein said at least one material feeder includes a rotating delivery portion rotating in a parallel plane to said first mold support means and in an opposed direction around an axis such that mold portions on said first mold support means intersect and pass beneath an arcuate path of said rotating delivery portion.

8. A molding apparatus as claimed in claim 1 further comprising cleaning apparatus to remove debris from at least one of said cooperating pair of mold portions after ejection of a product and prior to introduction of material for the production of a further product.

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9. A molding apparatus as claimed in claim 1 further including means to deliver a lubricant or releasing agent onto at least one of each cooperating pair of mold portions.



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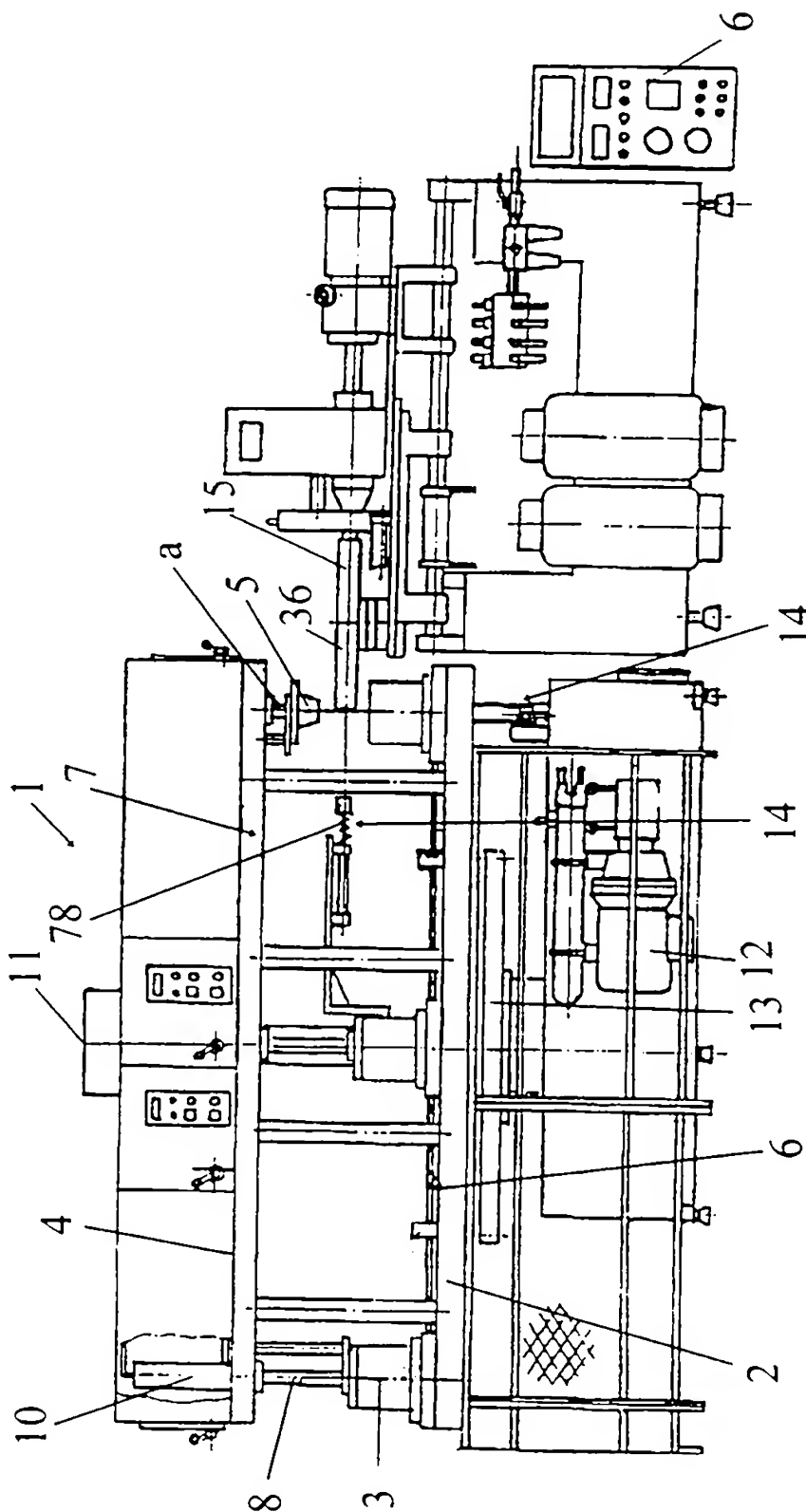


FIG. 1

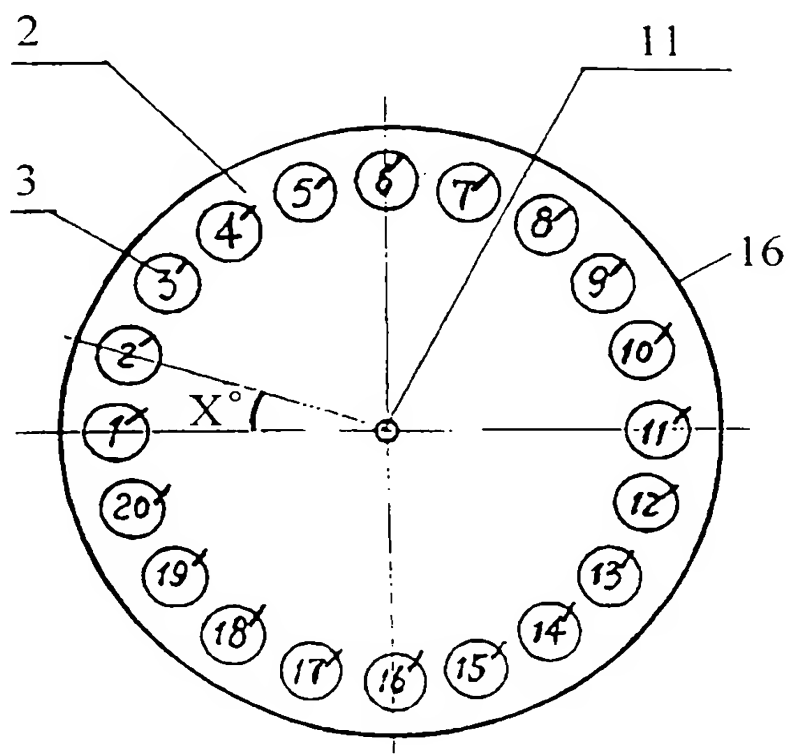


FIG. 2

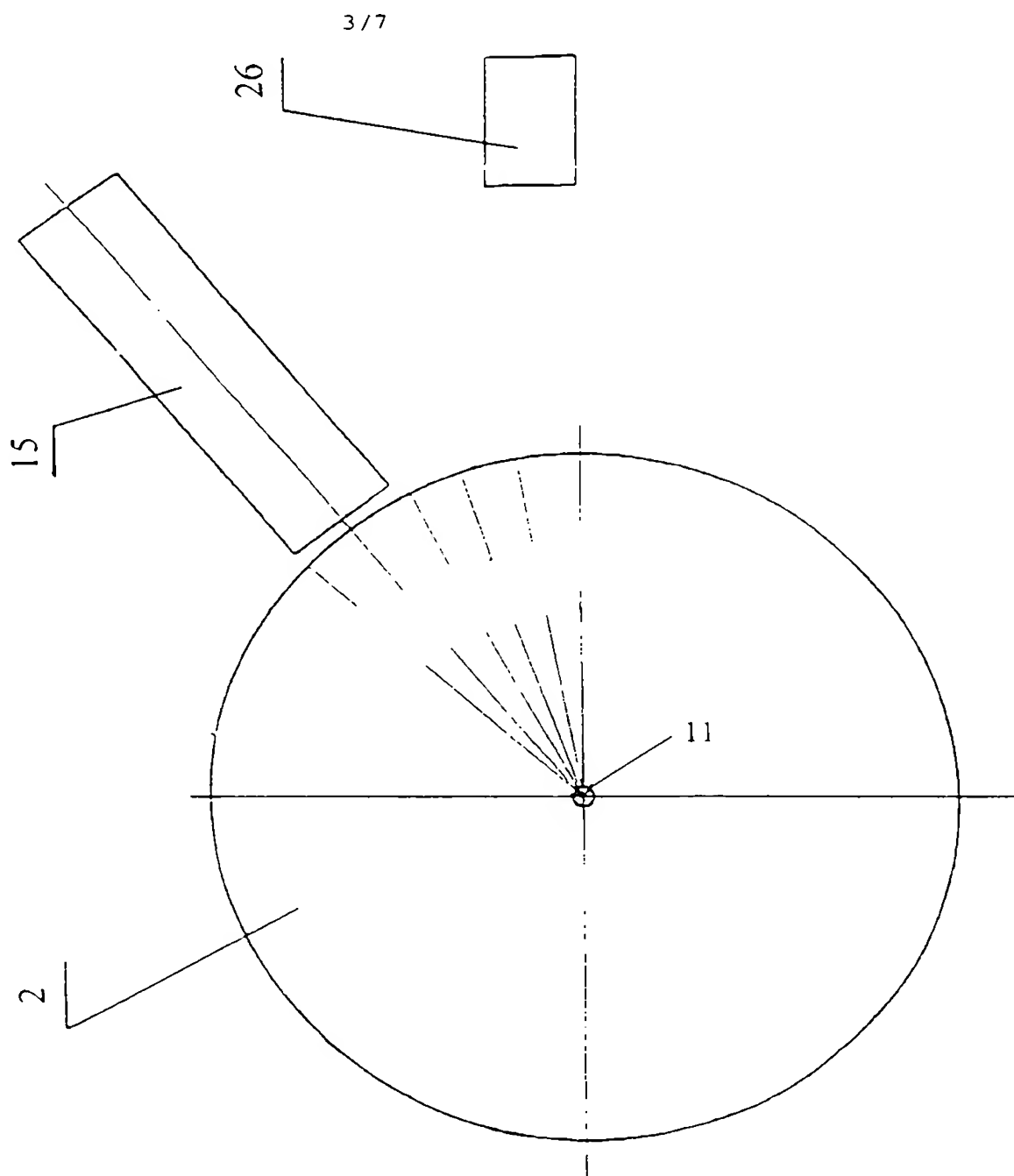


FIG. 3

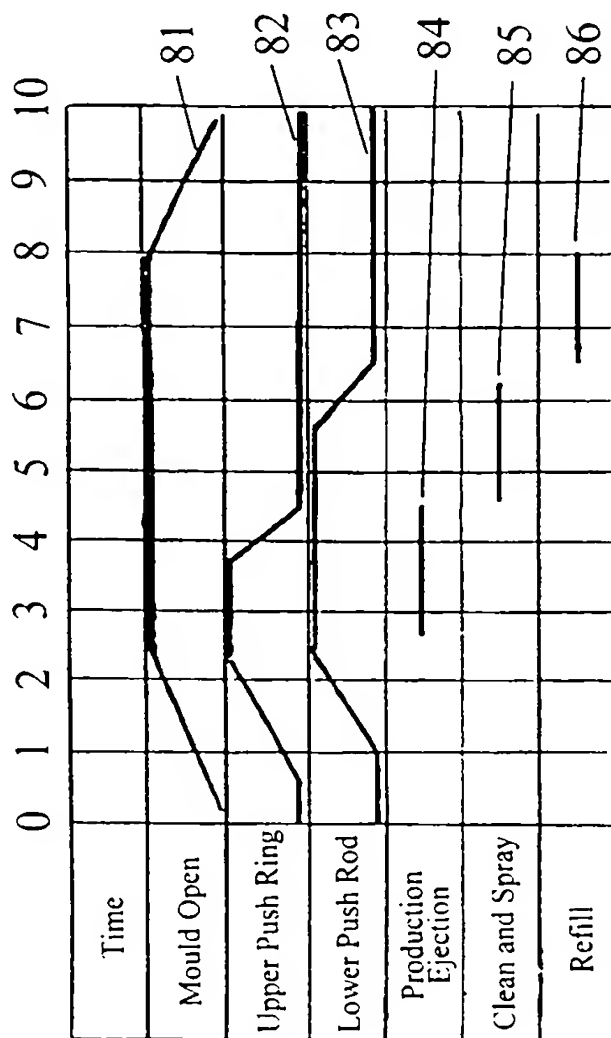


FIG. 4

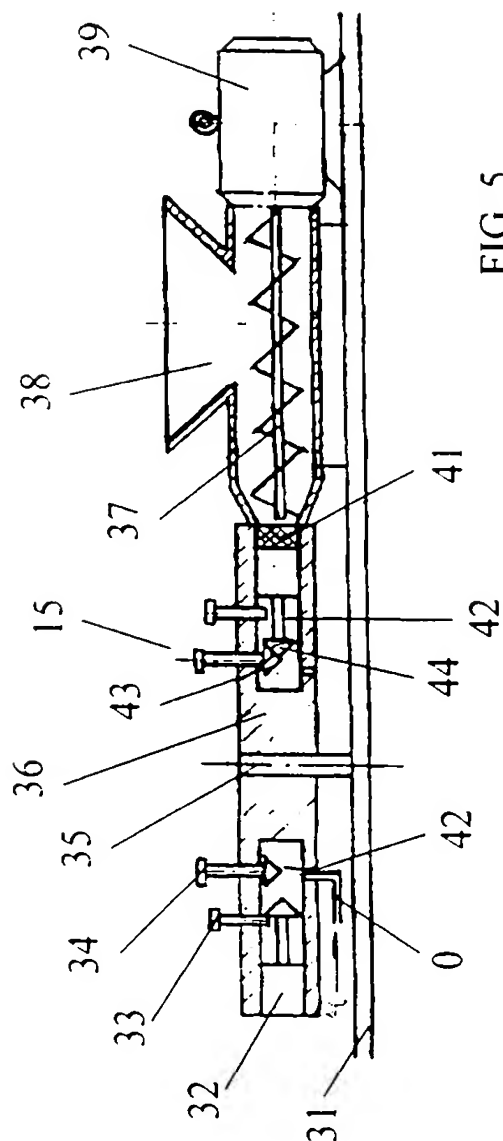


FIG. 5

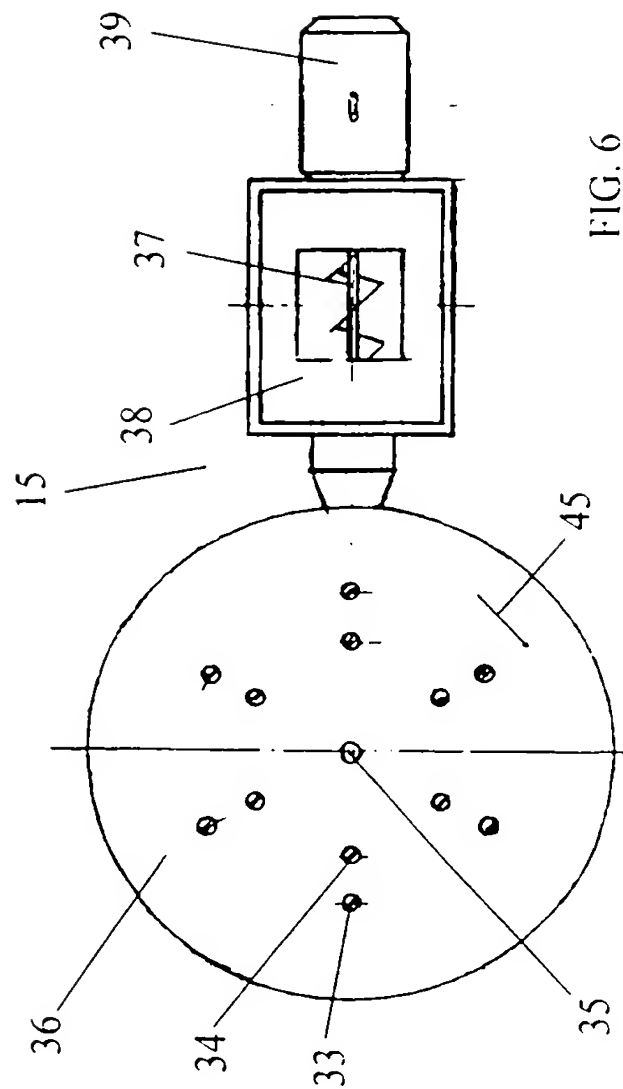
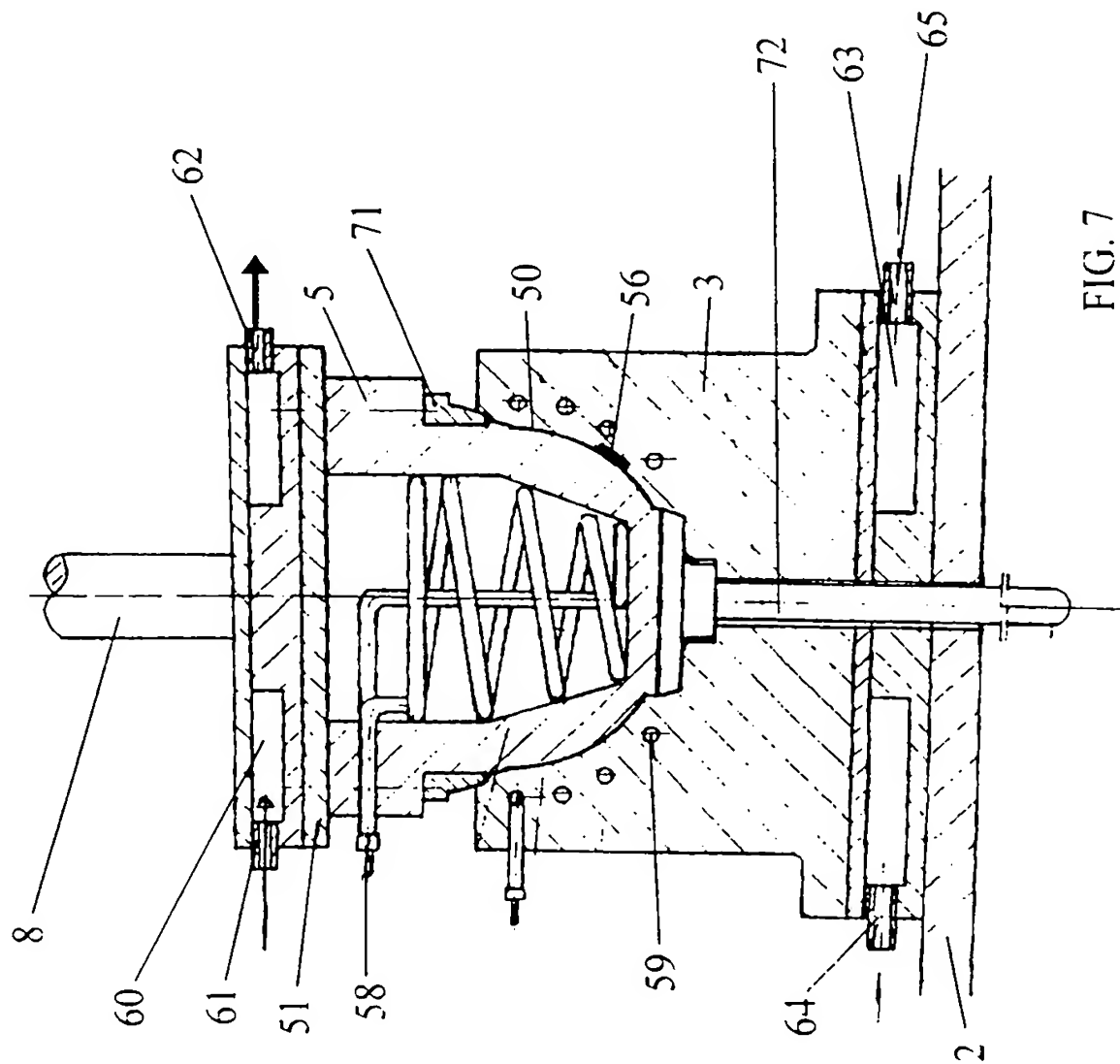


FIG. 6



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